Operating Instructions

KSR-TF 511

with contactless electronic switch

Contents

1 About this document

1.1 Function 3
1.2 Target group 3
1.3 Symbolism used 3

2 For your safety

2.1 Authorised personnel 4
2.2 Appropriate use 4
2.3 Warning about misuse 4
2.4 CE conformity 4

3 Product description

3.1 Configuration 5
3.2 Principle of operation 5
3.3 Operation 6
3.4 Storage and transport 6

4 Mounting

4.1 General instructions 8
4.2 Mounting information 10

5 Connecting to power supply

5.1 Preparing the connection 13
5.2 Wiring plan 13

6 Set up

6.1 Indication of the switching status 17
6.2 Function test 17
6.3 Function chart 18

7 Maintenance and fault rectification

7.1 Maintenance 19
7.2 Fault rectification 19
7.3 Exchange of the electronics 20
7.4 Instrument repair 22

8 Dismounting

8.1 Dismounting procedure 23
8.2 Disposal 23

9 Supplement

9.1 Technical data 24
9.2 Dimensions 26

32139-EN-060618

1 About this document

1.1 Function

This operating instructions manual has all the information you need for quick setup and safe operation. Please read this manual before you start setup.

1.2 Target group

This operating instructions manual is directed to trained, qualified personnel. The contents of this manual should be made available to these personnel and put into practice by them.

1.3 Symbolism used

Information, tip, note
This symbol indicates helpful additional information.

Caution: If this warning is ignored, faults or malfunctions can result.
Warning: If this warning is ignored, injury to persons and/or serious damage to the instrument can result.
Danger: If this warning is ignored, serious injury to persons and/or destruction of the instrument can result.

Ex applications
This symbol indicates special instructions for Ex applications.

- **List**
  The dot set in front indicates a list with no implied sequence.

→ **Action**
This arrow indicates a single action.

1 **Sequence**
Numbers set in front indicate successive steps in a procedure.

2 For your safety

2.1 Authorised personnel

All operations described in this operating instructions manual must be carried out only by trained specialist personnel authorised by the operator. For safety and warranty reasons, any internal work on the instruments must be carried out only by personnel authorised by the manufacturer.

2.2 Appropriate use

KSR-TF 511 is a sensor for level detection.

Detailed information on the application range of KSR-TF 511 is available in chapter "*Product description*".

2.3 Warning about misuse

Inappropriate or incorrect use of the instrument can give rise to application-specific hazards, e.g. vessel overfill or damage to system components through incorrect mounting or adjustment.

2.4 General safety instructions

KSR-TF 511 is a high-tech instrument requiring the strict observance of standard regulations and guidelines. The user must take note of the safety instructions in this operating instructions manual, the country-specific installation standards (e.g. the VDE regulations in Germany) as well as all prevailing safety regulations and accident prevention rules.

2.5 CE conformity

KSR-TF 511 is in CE conformity with EMC (89/336/EWG), fulfils Namur recommendation NE 21 and NE 23 and is in CE conformity with NSR (73/23/EWG).

Conformity has been judged according to the following standards:

- EMC:
  - Emission EN 61326: 1997 (class B)
  - Susceptibility EN 61326: 1997/A1:1998
- LVD: EN 61010-1: 2001

32139-EN-060618

3 Product description

3.1 Configuration

Scope of delivery

The scope of delivery encompasses:

- KSR-TF 511 level sensor
- Test magnet
- Documentation
  - this operating instructions manual
  - if necessary, certificates

Components

KSR-TF 511 consists of the following components:

- Housing with electronics
- process fitting with tuning fork

Fig. 1: KSR-TF 511

3.2 Principle of operation

Area of application

KSR-TF 511 is a level sensor with tuning fork for level detection.

It is designed for industrial use in all areas of process technology and can be used in liquids.

Typical applications are overfill and dry run protection. With a tuning fork of only 40 mm length, KSR-TF 511 can be also mounted, e.g. in pipelines from DN 25. The small tuning fork

allows use in vessels, tanks and pipes. Thanks to its simple and robust measuring system, KSR-TF 511 is virtually unaffected by the chemical and physical properties of the liquid.

It functions even under difficult conditions such as turbulence, air bubbles, foam generation, buildup, strong external vibration or changing products.

Fault monitoring
The electronics module of KSR-TF 511 continuously monitors via frequency evaluation the following criteria:

- Strong corrosion or damage on the tuning fork
- loss of vibration
- Line break to the piezo drive

If a malfunction is detected or in case of power failure, the electronics takes on a defined switching condition, i.e. the contactless electronic switch opens (safe condition).

Physical principle

The tuning fork is piezoelectrically energised and vibrates at its mechanical resonance frequency of approx. 1200 Hz. The piezos are fixed mechanically and are hence not subject to temperature shock limitations. The frequency changes when the tuning fork is covered by the medium. This change is detected by the integrated oscillator and converted into a switching command.

Power supply

KSR-TF 511 is a compact instrument, i.e. it can be operated without external evaluation system. The integrated electronics evaluates the level signal and outputs a switching signal. With this switching signal, a connected device can be directly activated (e.g. a warning system, a PLC, a pump etc.).

The exact range for power supply is stated in the "*Technical data*" in the "*Supplement*".

3.3 Operation

The switching status of KSR-TF 511 can be checked with closed housing (signal lamp). Products with a density >0.7 g/cm^3 (>0.025 lbs/in^3) can be detected.

3.4 Storage and transport

Packaging

Your instrument was protected by packaging during transport. Its capacity to handle normals loads during transport is assured by a test according to DIN 55439.

The packaging of standard instruments consists of environment-friendly, recyclable cardboard. For special versions, PE foam or PE foil is also used. Dispose of the packaging material via specialised recycling companies.

Storage and transport temperature

- Storage and transport temperature see "*Supplement - Technical data - Ambient conditions*"
- Relative humidity 20 … 85 %

4 Mounting

4.1 General instructions

Switching point

In general, KSR-TF 511 can be mounted in any position. The instrument must be mounted in such a way that the tuning fork is at the height of the requested switching point.

The tuning fork has lateral marking (notches), marking the switching point with vertical mounting. The switching point refers to water (1 g/cm^3 or 0.036 lbs/in^3). When mounting KSR-TF 511, make sure that this marking is at the height of the requested switching point. Keep in mind that the switching point of the instrument is shifted if the medium has a density other than water.

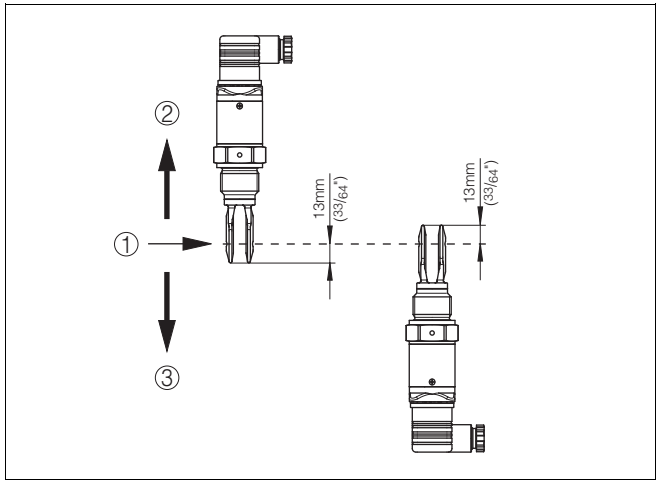

Fig. 2: Vertical mounting
1 Switching point approx. 13 mm (0.51 in)
2 Switching point with lower density
3 Switching point with higher density

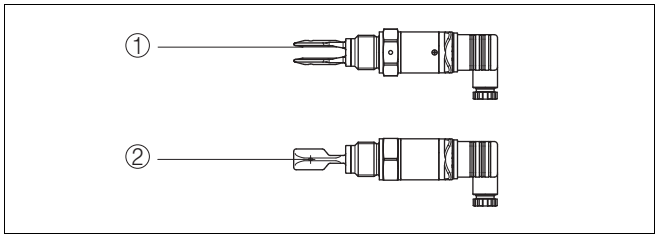

Fig. 3: Horizontal installation
1 Switching point
2 Switching point (recommended mounting position - particularly for adhesive products)

Moisture

Use the recommended cables (see chapter "*Connecting to power supply*") and tighten the cable gland.

You can give your KSR-TF 511 additional protection against moisture penetration by leading the connection cable downward in front of the cable entry. Rain and condensation water can thus drain off. This applies mainly to mounting outdoors, in areas where moisture is expected (e.g. by cleaning processes) or on cooled or heated vessels.

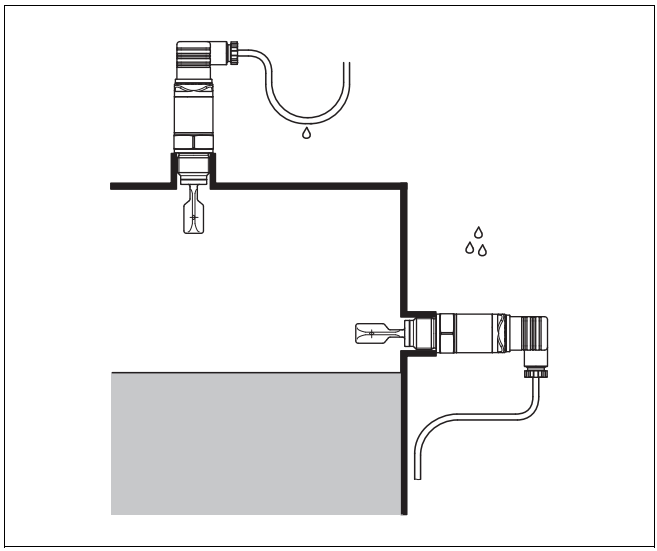

Fig. 4: Measures against moisture penetration

Transport

Do not hold KSR-TF 511 on the tuning fork.

Pressure/Vacuum

The process fitting must be sealed if there is gauge or low pressure in the vessel. Before use, check if the seal material is resistant against the measured product and the process temperature.

The max. permissible pressure is stated in the "*Technical data*" in the "*Supplement*" or on the type label of the sensor.

Handling

The vibrating level switch is a measuring instrument and must be treated accordingly. Bending the vibrating element will destroy the instrument.

Warning:
The housing must not be used to screw in the instrument! Applying tightening force on the housing can damage its internal mechanical parts.

To screw in, use the hexagon above the thread.

4.2 Mounting information

Welded socket

For welded socket with O-ring in front and welding marking.

KSR-TF 511 has a defined thread runout point. This means that every KSR-TF 511 is in the same position after being screwed in. Remove therefore the supplied flat seal from the thread of KSR-TF 511. This flat seal is not required when using a welded socket with front-flush O-ring.

Before welding, unscrew KSR-TF 511 and remove the rubber ring from the welded socket.

The welded socket has a marking (notch). For horizontal mounting, weld the socket with the notch facing upward or downward; in pipelines aligned with the direction of flow.

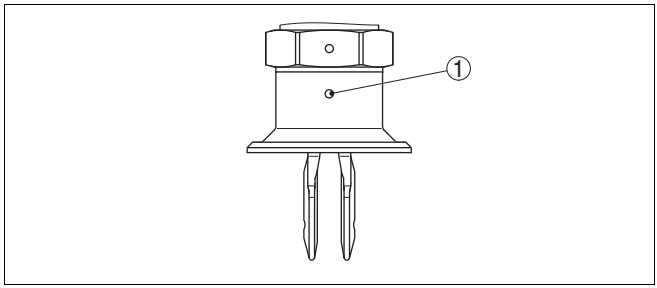

Fig. 5: Marking on the welded socket
1 Marking

Adhesive products

In case of horizontal mounting in adhesive and viscous products, the surfaces of the tuning fork should be vertical in order to reduce buildup on the tuning fork. The position of the tuning fork is marked by a marking on the hexagon of KSR-TF 511. With this, you can check the position of the tuning fork when screwing it in. When the hexagon touches the seal, the thread can still be turned by approx. half a turn. This is sufficient to reach the recommended installation position.

In adhesive and viscous products, the surfaces of the tuning fork should protrude into the vessel to avoid buildup. Therefore sockets for flanges and mountings bosses should not exceed a certain length.

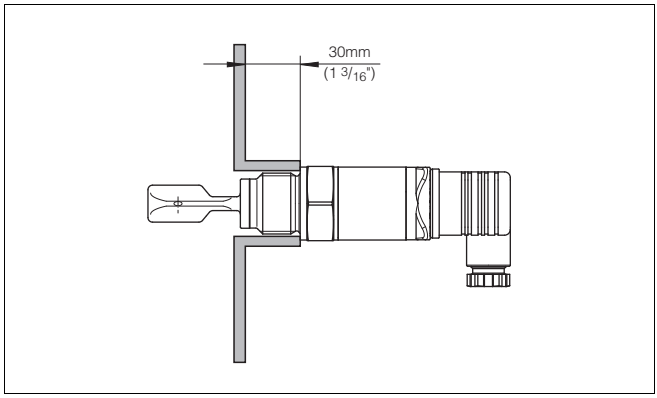

Fig. 6: Adhesive products

Inflowing material

If KSR-TF 511 is mounted in the filling stream, unwanted switching signals may be generated. Mount KSR-TF 511 at a location in the vessel where no disturbing influence from e.g. filling openings, agitators etc. can occur.

Flows

To minimise flow resistance caused by the tuning fork, KSR-TF 511 should be mounted in such a way that the surfaces of the fork are parallel to the product movement.

5 Connecting to power supply

5.1 Preparing the connection

Note safety instructions

Always observe the following safety instructions:

- Connect only in the complete absence of line voltage

Selecting the connection cable

KSR-TF 511 is connected with standard cable with round cross section. Depending on the plug connection, you have to select the outer diameter of the cable respectively so that the seal effect of the cable gland is ensured.

- Valve plug DIN 43650, ø 4.5 … 7 mm
- Valve plug QuickOn DIN 43650, ø 3.5 … 6.5 mm

Cable glands

Use cable with a round wire cross section and tighten the cable gland.

When mounting outdoors, on cooled vessels or in humid areas, in which cleaning is carried out e.g. with steam or high pressure, it is particularly important to seal the cable gland.

5.2 Wiring plan

Housing overview

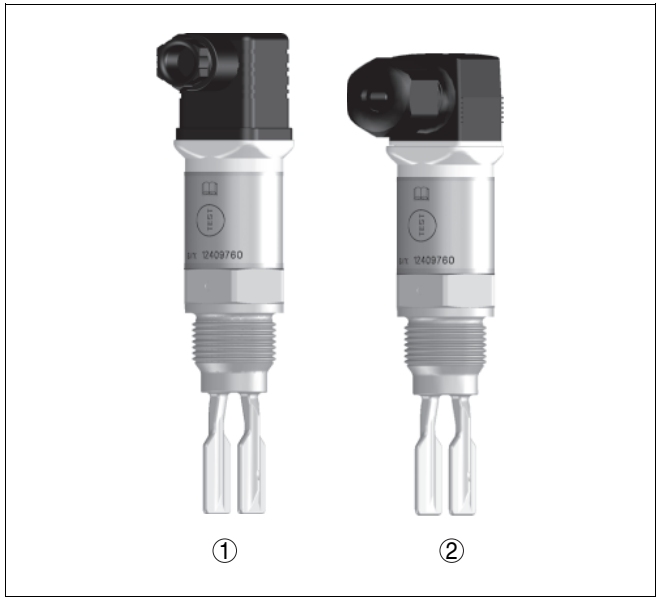

Fig. 7: Overview of the connection versions
1 Valve plug (DIN 43650)
2 Valve plug DIN 43650 with QuickOn connection

Plug versions

Valve plug (DIN 43650)

For this plug version, standard cable with round wire cross-section can be used. Cable diameter 4.5 … 7 mm, protection IP 65.

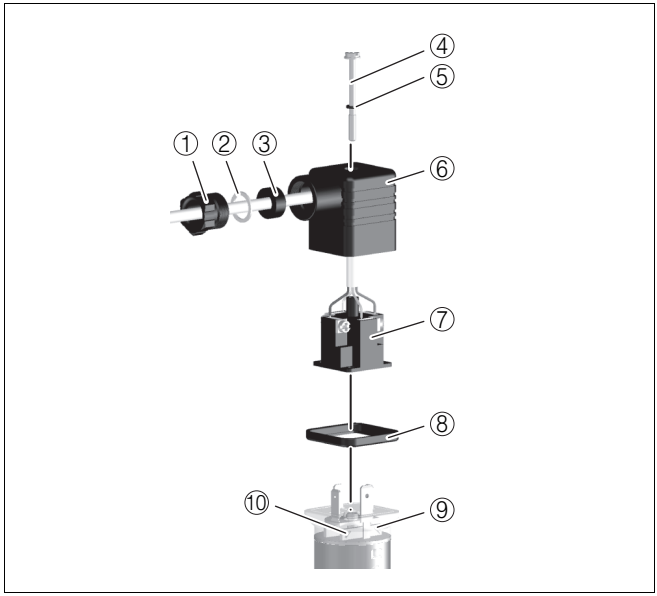

Fig. 8: Connection, valve plug DIN 43650

1 Pressure screw
2 Pressure disk
3 Seal ring
4 Fixing screw
5 Seal washer
6 Plug housing
7 Plug insert
8 Profile seal
9 Control lamp
10 KSR-TF 511

Valve plug - QuickOn DIN 43650

For this plug version you can use standard cable with round wire cross-section. The inner cables must not be dismantled. The plug connects the cables automatically when screwing them in. Cable diameter 3.5 … 6.5 mm, protection IP 65.

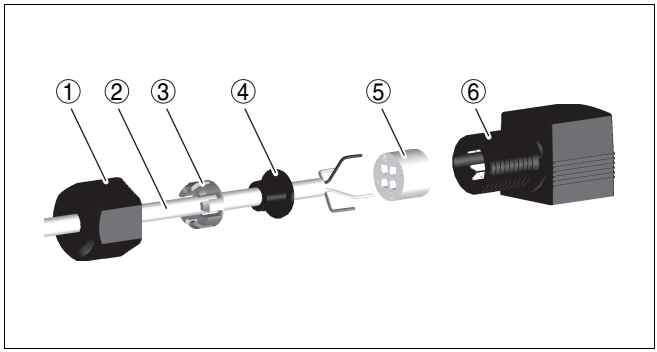

Fig. 9: Connection valve plug - QuickOn DIN 43650
1 Compression nut
2 Cable
3 Split taper socket
4 Seal insert
5 Strand
6 Plug housing

Contactless electronic switch

The instrument is used for direct control of relays, contactors, magnet valves, warning lights, horns etc. It must not be operated without intermediately connected load, because the electronic would be destroyed if connected directly to mains. It is not suitable for connection to low voltage PLC inputs. Domestic current is temporarily lowered below 1 mA after switching off the load so that contactors, whose holding current is lower than the constant domestic current of the electronics (3 mA), are reliably switched off.

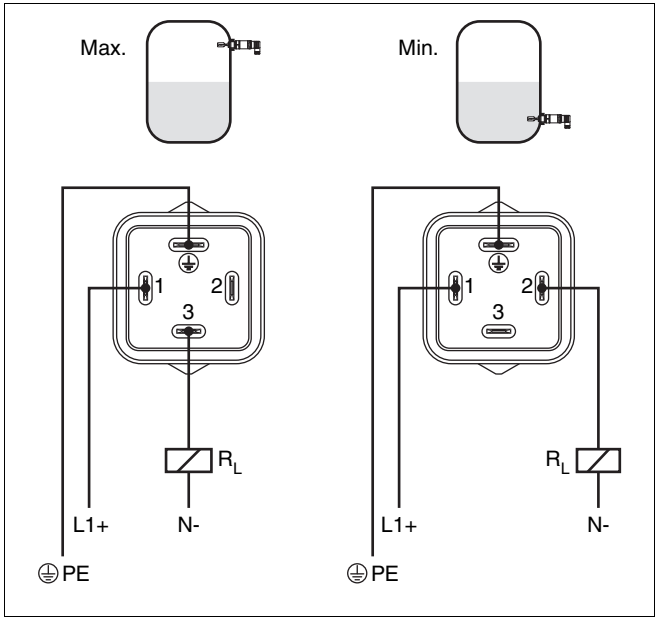

Fig. 10: Wiring plan - contactless electronics switch with valve plug DIN 43650
PE Protective ground
RL Load resistor (contactor, relay etc.)

6 Set up

6.1 Indication of the switching status

The switching status of the electronics can be checked on the upper part of the housing.

6.2 Function test

KSR-TF 511 has an integrated test switch which can be activated magnetically. Proceed as follows to test the instrument:

→ Hold the test magnet (accessory) to the magnet symbol on the instrument housing

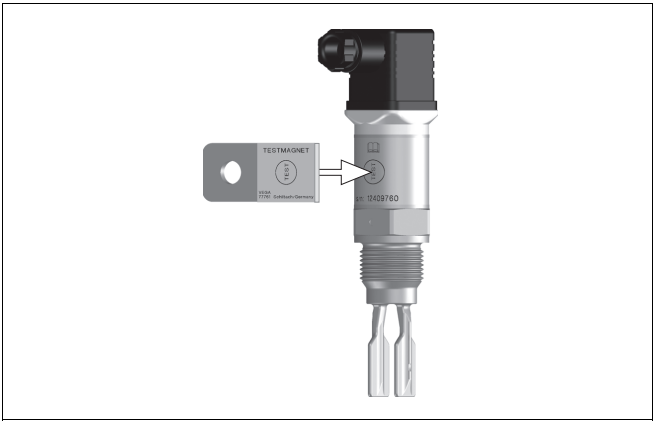

Fig. 11: Function test

The test magnet changes the current switching condition of the instrument. You can check the change on the signal lamp. Please note that the connected instruments are activated during the test.

If KSR-TF 511 does not switch over after several tests with the test magnet, you have to check the plug connection and the connection cable and test the instrument again. If there is no switching function, the electronics will be defective. In this case you have to exchange the electronics or return the instrument to our repair department.

Caution:

It is absolutely necessary that you remove the test magnet after the test from the instrument housing.

6.3 Function chart

The following chart provides an overview of the switching conditions depending on the adjusted mode and level.

	Level	Switching status	Control lamp
Mode max.		Switch closed	Green
Mode max.		Switch open	red
Mode min.		Switch closed	Green
Mode min.		Switch open	red
Failure	any	Switch open	flashes red

7 Maintenance and fault rectification

7.1 Maintenance

When used as directed in normal operation, KSR-TF 511 is completely maintenance-free.

7.2 Fault rectification

Causes of malfunction

KSR-TF 511 offers maximum reliability. Nevertheless faults can occur during operation. These may be caused by the following, e.g.:

- Sensor
- Process
- Power supply
- Signal processing

Fault rectification

The first measure to be taken is checking the output signal. In many cases, the causes can such be determined and failures can be rectified.

24 hour service hotline

If the following measures are not successful, you can call the VEGA service hotline in urgent cases under the phone no. **+49 1805 858550**.

The hotline is available to you 7 days a week round-the-clock. Since we offer this service world-wide, the support is only available in the English language. The service is free of charge, only the standard telephone costs will be charged.

? Control lamps off

- Voltage supply interrupted.

→ Check the voltage supply and the cable connection

→ Exchange the electronics module

? Signal lamp flashes red

- There was no load connected when connecting to power supply

→ Connect the instrument correctly

→ Check if the tuning fork is damage or extremely corroded

- Frequency error

→ Adjust the instrument correctly

? The signal lamp flashes alternately red and green

- Shortcircuit or overload

→ Check the electrical connection

7.3 Exchange of the electronics

To exchange the electronics in case of failure, it is not necessary to dismount the instrument.

Dismounting the electronics module can destroy the housing seal. Therefore only open the instrument if you want to insert a new electronics module. The housing seal is supplied with the electronics module.

You need an electronics module type SWE50T or SWE50C. If you want to use an electronics module with a different signal output (e.g. transistor output SWE50T), you can download the suitable operating instructions manual from our homepage under Downloads. Take note of the specifications in the respective operating instructions manual.

Proceed as follows to exchange the electronics module:

1 Separate KSR-TF 511 from operating voltage
2 Loosen fixing screw (1) of the valve plug (2) with a wrench
3 Remove valve plug (2) acc. to drawing
4 Remove lateral fixing screw (7) with a crosstip screwdriver
5 Pull electronics module (4) carefully out of the housing (8)
6 Remove the plug of the connection cable (6) from the socket on the oscillator (4)
7 Set the 16-step rotating switch (5) of the new replacement electronics module (4) to the value of the defective electronics module
8 Insert the connection cable (6) in the socket of the new electronics module (4)
9 Insert electronics module (4) into the housing (8). Make sure that the lateral thread on the electronics module is above the hole on the housing (8)
10 Push the electronics module (4) flush into the housing (8)
11 Screw in the lateral fixing screw (7) with a crosstip screwdriver
12 Plug the valve plug (2) to the instrument, make sure that the profile seal (3) is placed correctly

13 Tighten fixing screw (1) with a wrench

KSR-TF 511 is again ready for operation.

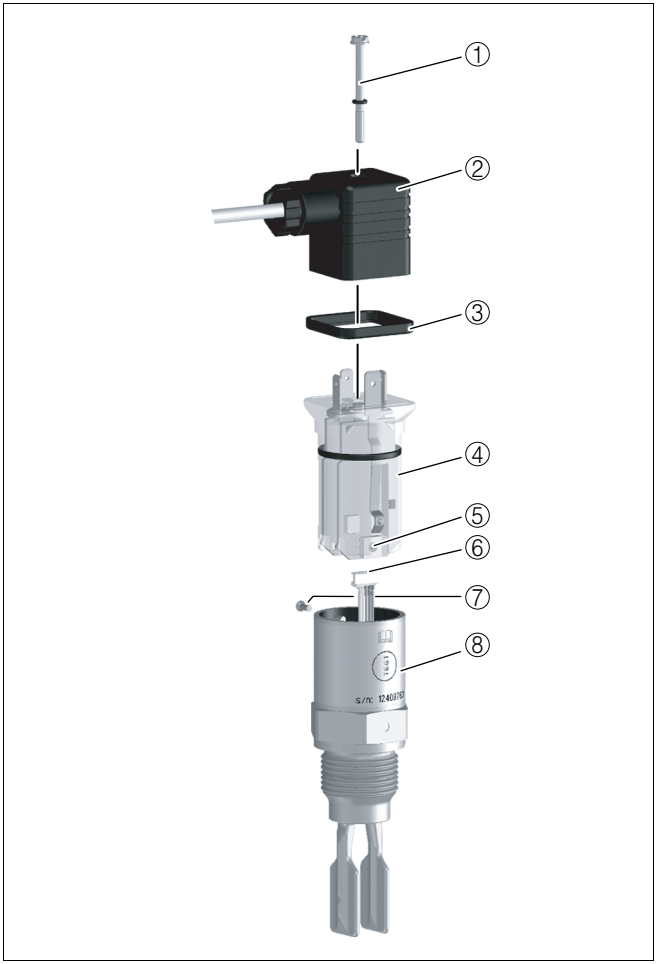

Fig. 12: Exchange the electronics module

1 Fixing screw
2 Valve plug (DIN 43650)
3 Profile seal
4 Electronics module
5 Rotary switch (16-steps)
6 Plug connector
7 Fixing screw
8 Housing

7.4 Instrument repair

If a repair of KSR-TF 511 is necessary, please proceed as follows:

- Clean the instrument and pack it damage-proof
- Attach a description of the fault, the ambient conditions and measured product to the instrument
- If necessary, attach a safety sheet to the instrument
- Please send the instrument to the respective address of your agency or the main office in Germany. In Germany, pleased send the instrument directly to our main office.

8 Dismounting

8.1 Dismounting procedure

Warning:
Before dismounting, be aware of dangerous process conditions such as e.g. pressure in the vessel, high temperatures, corrosive or toxic products etc.

Take note of chapters "*Mounting*" and "*Connecting to power supply*" and carry out the listed steps in reverse order.

8.2 Disposal

The instrument consists of materials which can be recycled by specialised recycling companies. We use recyclable materials and have designed the electronic modules to be easily separable.

WEEE directive 2002/96/EG
This instrument is not subject to the WEEE directive 2002/96/EG and the respective national laws (in Germany, e.g. ElektroG). Pass the instrument directly on to a specialised recycling company and do not use the municipal collecting points. These may be used only for privately used products according to the WEEE directive.

Correct disposal avoids negative effects to persons and environment and ensures recycling of useful raw materials.

Materials: see "*Technical data*"

If you cannot dispose of the instrument properly, please contact us about disposal methods or return.

9 Supplement

9.1 Technical data

General data

Material 316L corresponds to 1.4404 or 1.4435

Materials, wetted parts	
– Tuning fork	316L
– Process seal	Klingersil C-4400
– Process fittings	316L
Materials, non-wetted parts	
– Housing	316L and plastic PEI
Weight	approx. 250 g (ca. 9 oz)
Process fittings	
– Thread	G¾ A, G1 A, ¾ NPT or 1 NPT
– hygienic fittings	Tri-Clamp 1", Tri-Clamp 1½", bolting DN 25 PN 40, bolting DN 40 PN 40, SMS
Surface quality	
– Standard	R_a <3.2 µm (1.26^{-4} in)
– hygienic version	R_a <0.8 µm (3.15^{-5} in)

Meas. accuracy

Hysteresis	approx. 2 mm (0.08 in) with vertical installation
Integration time	approx. 500 ms
Frequency	approx. 1200 Hz

Ambient conditions

Ambient temperature on the housing	-40 … +70 °C (-40 … +158 °F)
Storage and transport temperature	-40 … +80 °C (-40 … +176 °F)

Process conditions

Process pressure	-1 … 64 bar (-14.5 … 938 psi)
Process temperature - Standard	-40 … +100 °C (-40 … +212 °F)
Process temperature - High temperature version (option)	-40 … +150 °C (-40 … +302 °F)
Temperature shock	no limitation
Viscosity - dynamic	0.1 … 10000 mPa s
Density	0.7 … 2.5 g/cm³ (0.025 … 0.9 oz/in³)

32139-EN-060618

Operation	
Plug connections	Specification see "*Connecting to power supply*"
Signal lamp (LED)	
– Green	Switch closed
– red	Switch open
– Red (flashing)	Failure - Switch open

Output variable	
Output	Contactless electronic switch
Modes min / max (changeover by electrical connection)	
– max.	Max. detection or overflow/overfill protection
– min.	Min. detection or dry run protection

Voltage supply	
Supply voltage	20 … 253 V AC, 50/60 Hz, 20 … 253 V DC
Domestic current requirement	approx. 3 mA (via load circuit)
Load current	
– min.	10 mA
– max.	250 mA

Electrical protective measures	
Protection	
– Valve plug (DIN 43650)	IP 65
– Valve plug QuickOn (DIN 43650)	IP 65
Overvoltage category	III
Protection class	I

Approvals
Overfill protection acc. to WHG

9.2 Dimensions

KSR-TF 511, standard version

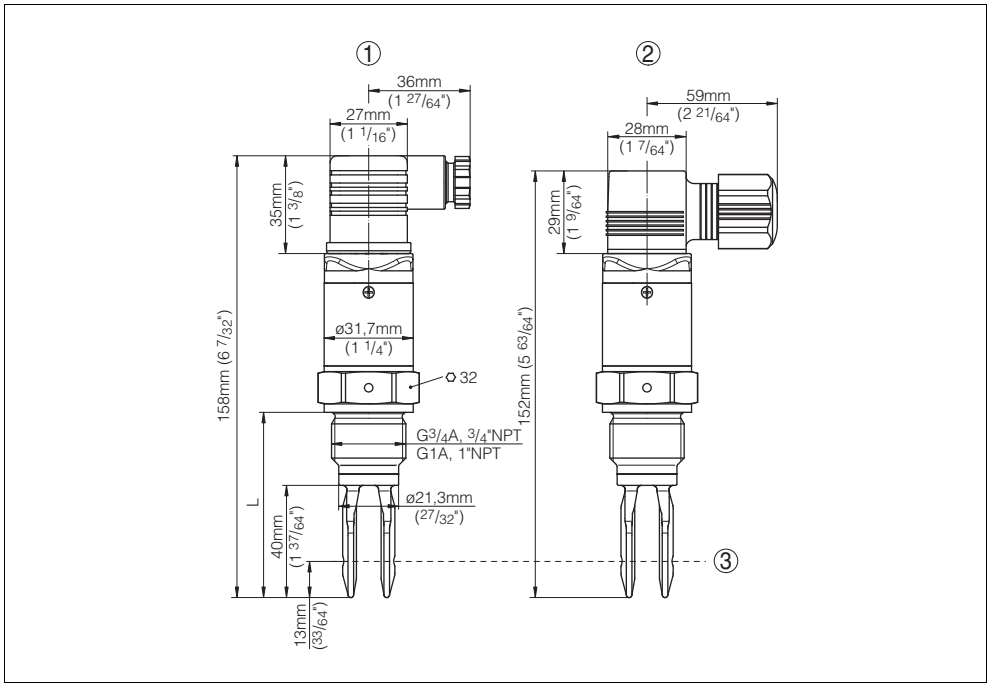

Fig. 13: KSR-TF 511, standard version
1 Thread G¾ A, G1 A, ¾ NPT or 1 NPT (valve plug DIN 43650)
2 Thread G¾ A, G1 A, ¾ NPT or 1 NPT (valve plug DIN 43650 with QuickOn connection)
3 Switching point
L Length with G¾ A, ¾ NPT: 66 mm (2.6 in)
L Length with G1 A, 1 NPT: 69 mm (2.7 in)

KSR-TF 511, high temperature version

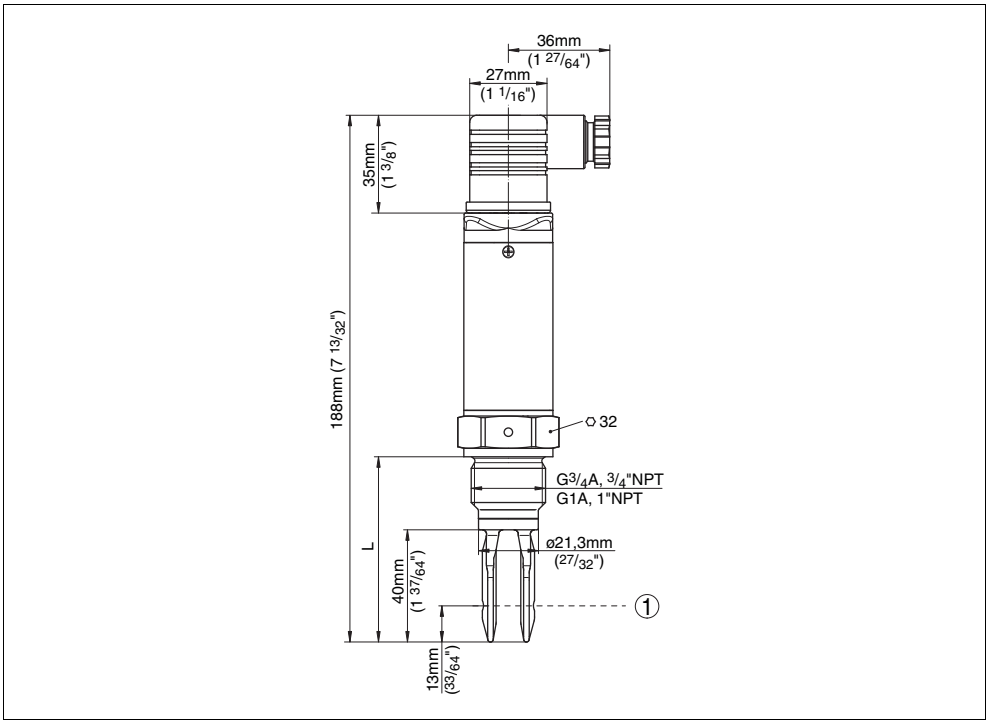

Fig. 14: KSR-TF 511, high temperature version
1 Switching point
L Length with G¾ A, ¾ NPT: 66 mm (2.6 in)
L Length with G1 A, 1 NPT: 69 mm (2.7 in)

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